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Section C.—Belfast, 1902.]

The So-called 'Fossil' Water of Sedimentary Strata, as illustrated by the Sandstones of the Moray Firth Basin. By WILLIAM MACKIE, M.A., M.D.

A series of determinations of the soluble chlorides and sulphates locked up in the interstices of the Elgin sandstones was made to test the thesis that from such an examination it is possible to determine the character, as to freshness or salinity, of the waters of the basin of deposit of a series of sedimentary rocks.

In the present case, though some interesting side issues were no doubt made manifest, the results as regards the main issue were found to be entirely negative. In all, thirty-eight determinations were made: 7 in L.O.R. rocks, 17 in U.O.R., 6 in Triassic, 1 in Jurassic, and for the purposes of illustration 7 in recent deposits. The averages obtained were:—

	Cl per cent.	SO ₄ per cent.
L.O.R.	·0101	·0180
U.O.R.	·0077	·0064
Triassic	·0050	·0051
Jurassic	·0037	·0113
Recent	·0049	·0042

Average over all—Cl, ·0063 per cent.; SO₄, ·009 per cent.

Some interest attaches to these averages in relation to the question of the saltiness of the sea. They show at least that a fairly large proportion of that saltiness may reasonably be referred to the washing-out in past times of the chlorides and sulphates from sedimentary rocks.

The increase shown by these averages from the younger to the older formations—or, to put it otherwise, from the overlying to the underlying rocks—may be ascribed to the washing-in of the soluble salts from the surface and concentration in the depths; but doubt may be expressed if that covers the whole case.

Remarkable variations were obtained in specimens of the same sandstone even when collected in the same quarry. These variations were in some cases so extreme as to preclude any general conclusion as to the character of the waters of the basin of deposit. It was also found that the percolation of rain-water may reduce the chlorides to ·0005 per cent. or less, and the sulphates to a like quantity, or even to entire absence. Water passing down joints and fissures, it was also found, tends to wash back the soluble salts and concentrate them at some distance back from the fissures. Chlorides, and less frequently the sulphates, were found to increase in rocks secondarily stained with ferric hydroxide, and also in the manganese areas referred to in the accompanying paper. It has been shown elsewhere that traces of the heavy metals are disseminated through the Elgin sandstones generally, and also tend to increase in relative proportion in the manganese areas. Increases in lime, magnesia, and alkali have also been demonstrated as obtaining in the same areas. From the intimate relationship of all these substances it is inferred, with some degree of certainty, that they formed part of the same general infiltration. If so, it must also be inferred at the same time that the original 'fossil' water of these sandstones must have long ago been washed out, or at least seriously masked in the process. Generally it may be said that such washing-out of the original 'fossil' water may have taken place anywhere, and that the results of subsequent infiltrations may have themselves been replaced again and again by other infiltrations, and so on. The inference therefore, that the soluble salts of a series of deposits represent the salts of the original waters of the basin of deposit must in the majority of instances be a very uncertain one, if indeed any degree of certainty can be claimed for such an inference under any circumstances.

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